(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 669 181 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
29.04.1998 Bulletin 1998/18

(51) Int. Cl.[6]: **B23D 49/16**

(21) Application number: **95200439.8**

(22) Date of filing: **22.02.1995**

(54) Adjustable guide shoe for reciprocating saw

Verstellbarer Führungsschuh für eine Säge mit hin- und hergehendem Sägeblatt

Plaque de guidage réglable pour scie alternative

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **23.02.1994 US 200384**

(43) Date of publication of application:
30.08.1995 Bulletin 1995/35

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Description

The present invention relates to a power saw according to the precharacterising portion of claim 1 having a reciprocating, and sometimes oscillating, saw blade holder. More particularly, the present invention relates to an adjustable guide shoe for such a power tool.

Background Of The Invention

Reciprocating saws are provided with a shoe which permits the operator to position the saw relative to the work being cut. As is known to those who are experienced in using such tools, for a particular application there is an optimum position for the shoe. Adjustment of the shoe makes plunge and pocket cuts easier and extends the blade life by cutting with different areas of the blade.

A typical shoe support is secured into position with adjusting screws. These screws pass through slots in the shoe support and thread into the front end of the gear housing clamping the support and shoe in the desired position. Adjustment of the shoe position requires the use of a separate tool, such as a screwdriver. This adjustment procedure is often not performed by the operator because the procedure consumes appreciable time and is cumbersome. Moreover, the separate tool necessary to loosen or tighten the screws is, more often than not, lost or misplaced. Consequently, optimum positioning of the shoe for a given application may often not be achieved.

Another form of guide shoe adjustment mechanism is shown in US-A 5,007,172, which issued on April 16, 1991 to Bernard Palm. According to the disclosure in that patent, adjustment is accomplished by rotating a lever. Attached to this lever is a lock pin which is pivotally mounted in the front end of the gear housing transverse to the shoe support. The pin's geometry comprises a "D" shaped formation having the rounded portion thereof adapted for engagement in a selected one of three arcuate grooves formed in the support to secure the support, and hence the shoe, into the desired position. To release and reposition the shoe, the lever is rotated allowing the flat portion of the pin to be parallel with the flat portion of the support thereby providing clearance which permits the support and shoe to move freely. When the shoe has been moved to its desired position, the lever is rotated back enabling the rounded portion of the pin to engage and be received in the selected arcuate groove in the support thereby to establish the new position for the shoe.

There are several disadvantages with the mechanism disclosed in patent No. 5,007,172. First, when the actuating lever is in the "lock" position, friction must be relied upon to hold the lever in place. The amount of friction available diminishes with usage over time because of wear. When the friction diminishes the support gains freedom of movement, appearing loose or insecure, thereby increasing the chances of having a locking pin becoming mistakenly disengaged due to looseness. Secondly, the particular design under discussion does not incorporate a self-locating action for the locking pin to align itself with the arcuate grooves in the support. The operator must jiggle the support to "feel" the position wherein the rounded portion of the pin will be received in one of the arcuate recesses in the support. Third, the shoe support according to this prior art design is in the form of a post with flats and grooves and is thus expensive to manufacture. These disadvantages are overcome with a power saw having the features of claim 1.

Summary Of The Invention

The present invention provides a guide shoe mechanism for a power tool which does not require a separate tool for adjustment purposes and which incorporates a self-positioning and self-locking feature. Further, the mechanism of the present invention can be readily and inexpensively manufactured and incorporated in the housing of a power reciprocating saw.

Description Of The Drawings

Figure 1 is an exploded isometric view of one embodiment of the present invention;
Figure 2 is an enlarged side view of the support bar and the actuating plunger;
Figure 3 is an exploded isometric view of a modified version of the invention; and
Figure 4 is an exploded isometric view of a further modified version of the invention.

Description Of The Invention

Referring to Figure 1, a power tool in the form of a reciprocating saw is generally designated 10. The tool includes a housing having clam shell sections 12 and 14. The tool suitably mounts a cylindrical blade holder 15 for reciprocating movement. The blade holder mounts a saw blade 16. Of course, the power tool includes a motor, normally an electric motor, which drives a suitable gear mechanism and transmission to impart reciprocating movement to the blade holder 15. The tool may also be provided with mechanism to provide an orbital movement to the saw blade 16.

The housing shell 12 includes an internal wall formation 18 which cooperates with the lower portion of the shell 12 to define a slot 20. The slot includes a flat or planar lower surface 20a and an upper planar surface 20b. It is noted that these planar surfaces are interrupted by an upper aperture 22a and a lower aperture 22b. The clam shell section 14 includes housing formations (not shown) which are partially received within the slot 20 and the apertures 22a and 22b when the clam

shell sections 12 and 14 are mounted together. When the housing shell sections are mounted together, the slot 20 is rectangular in cross section, elongated in the direction of reciprocation of the blade holder 15, and opens at the front of the nose portion of the power tool. When these housing shell sections are secured together, the aperture 22b will be in the form of a small rectangular opening in the bottom surface of the housing shell 12 for accommodating the actuator of a plunger to be described below.

The adjustable shoe 25 is essentially of conventional construction including side flanges 25a. The shoe 25 is mounted to a support bar 28 for pivoting movement relative thereto. In this regard, the support 28 is provided with a pair of identical ears, one such ear being shown in Figure 2 as 30. The ear 30 includes an aperture 32 receiving a pin 34. It is understood of course that a pair of the pins 34 is provided for respective engagement with the ears 30.

The support bar 28 is generally in the form of an elongated bar having a central aperture 36. The bar 28 is notched so as to provide plural sets of opposed cam faces 38 and 39, 40 and 41, and 42 and 43 along each side edge of the support bar. Referring to Figure 2, it is noted that the opposed cam faces of each set of cams are symmetrically disposed with respect to a plane located between the cam faces and perpendicular to the support bar 28.

The present invention also includes a plunger, generally designated 45, which includes a body portion 46. The body portion is provided with opposed cam surfaces 48, 49. The cam surfaces 48 and 49 are symmetrically inclined with respect to a plane which passes centrally of the plunger 45 and is perpendicular to the direction of movement of the support bar 28.

The plunger 45 further includes a stub formation 50 adapted to be received within one end of a coil spring 52, the latter being captured within the aperture 22a when the clam shell housing sections are secured together. The coil spring 52 acts to urge the plunger 45 downwardly and toward the support bar 28. The plunger 45 also includes an actuating button 54 which extends through the aperture 22b and projects slightly below the lower surface of the housing shell 12.

Referring to Figure 2, it is seen that the opposed planar faces of each set of cam faces, such as the faces 40 and 41, diverge upwardly. The cam surfaces of the plunger 45 are of complimentary configuration in that the cam surfaces 48 and 49 converge downwardly thus affording a wedging action between the plunger 45 and the selected side-by-side sets of opposed cam faces. As noted in Figure 2, a space is provided between the lower surfaces of the bar 46 of the plunger and the upper surface 28a of the support bar. Thus, the plunger 45, under the influence of the spring 52, may be wedged into secure engagement with the support bar.

In use, the operator will engage the actuator 54 of the plunger 45 with one of his or her fingers thus raising the plunger bar 46 such that it is out of the path of movement of the upper extremities of the cam faces on the support bar 28. The operator then manipulates the support bar manually such that selective sets of cam faces are positioned generally adjacent the bar 46 of the plunger 45. The operator then may release the plunger thus permitting the spring 52 to urge the bar 46 toward the support bar 38. The operator may then jiggle the support bar in either direction for fine positioning of the same until the plunger bar 46 snaps into engagement with selected sets of the cam faces under the influence of the spring 52. When it is desired to insert or remove the support 28 and foot 25, it is only necessary to depress the plunger portion 54 and hold the same while grasping the support bar or shoe for removal or installation.

Referring now to Figure 3 which shows a slightly modified form of the present invention, the parts which are the same as the parts of the embodiment of Figures 1 and 2 are indicated by the same numerals; the parts which are modified are indicated by the prime form of numeral.

According to the embodiment of Figure 3, the support bar 28 is notched somewhat differently to provide the various sets of cam faces, including the faces 38', 40' and 42'. To accommodate for this change in the configuration of the support bar, the body portion 46' of the plunger 45' is shortened so as to clear the side rails 28c and 28d of the support bar. The embodiment of Figure 3 operates in the same manner as the embodiment of Figures 1 and 2 as the plunger cam surfaces 48' and 49' will be snugly engaged in a wedging manner with the sets of opposed planar cam faces extending along each side of slot 36' in the support bar 28'.

Referring to Figure 4 which shows another modified form of the present invention, the parts which are the same as the embodiment of Figures 1 and 2 are indicated by the same numerals; the parts which are modified are indicated by the double prime form of numeral.

According to this embodiment, the tool housing is constituted by upper and lower clam shell sections 12" and 14", respectively. The lower section includes formations 18" defining the slot 20" for receipt of the support bar 28 which mounts the shoe 25. The lower housing shell includes formations defining an aperture 22" communicating with the slot 20".

The plunger 45" includes an upper cylindrical section 50" adapted to receive the coil spring 52". The plunger also includes a cam formation defined by the frusto-conical formation 46". When the plunger 45" and spring 52" are received within the aperture 22", the portion 54" of the plunger projects from the lower housing section 14" to permit manual actuation of the plunger.

The support bar 28 includes plural sets of cam faces 38" and 40". Each of these cam faces can be considered as a segment of an imaginary frusto-conical section which converges from top to bottom as seen in Figure 4. Diametrically opposed segments of the frusto-

conical formation 46" on the plunger will engage the opposed frusto-conical cam surfaces on the support bar to provide the wedging action for locating the shoe in its desired position.

Thus, it will be seen that the present invention provides a quick release adjustable shoe which is easy to operate and which does not require the use of special tools, such as a screwdriver or Allen wrench. The present invention allows for more efficient use of the saw blade and greater control over the depth of cut. The wedge-shaped cam surface on the plunger and support bar in conjunction with a positive bias by the compression spring provide a positive self-locating action in each one of the three side-by-side sets of opposed cam faces. Although the present invention discloses two or three positions for the support bar, it will be appreciated that the present invention embodies any desired number of positions for the support bar. The invention has further advantages in that the opening in the gear housing, where the mechanism is incorporated, can be cast and does not require secondary machining. Finally, the plunger may be made from a powdered metal material and both the supporting shoe may be made from 3,175 mm (1/8 inch) sheet material, all contributing to a low-cost adjustable shoe mechanism.

Claims

1. A power saw (10) having a housing including a nose section (12, 14), a saw blade holder (15) projecting from said nose section (12, 14) for reciprocating movement relative thereto, said nose section (12, 14) being provided with a slot (20) in parallel spaced relationship with said blade holder (15) and opening to the exterior of said nose section (12, 14), said nose section also being provided with an aperture (22a, 22b) in communication with said slot (20), a support member (28) received within said slot (20) for reciprocal sliding movement therein and having an outer end, a guide shoe (25) pivotally mounted on the outer end of said support member (28), characterized in that

   a. said support member (28) has the form of a bar, having plural sets of cam faces (38, 39; 40, 41; 42, 43) spaced longitudinally thereof;
   b. a plunger (45) is mounted in said aperture (22a, 22b) for movement along a path generally perpendicular to the path of movement of said support bar (28);
   c. biasing means (52) are present urging said plunger (45) into engagement with said support bar (28); and
   d. said plunger (45) has cam surfaces (48, 49) adapted for respective engagement with the cam faces (38, 39 etc.) of a selected one of said sets of cam faces in response to fine positioning of the support bar (28) relative to the plunger (45).

2. The power saw according to claim 1, characterized in that said cam faces (38, 39 etc.) are inclined with respect to a plane containing said support bar (28) and wherein said cam surfaces (48, 49) are also inclined in complimentary relationship with said cam faces (38, 39 etc.) on the support bar (28) to provide a wedging action between the latter (28) and said plunger (45).

3. The power saw according to claim 1, characterized in that

   a. each set of cam faces (38, 39 etc) comprises a pair of opposed planar formations symmetrically inclined with respect to a plane perpendicular to the path of movement of said support bar (28) so as to diverge with respect to respective cam surfaces (48, 49) on said plunger (45);
   b. said cam surfaces (48, 49) on said plunger (45) being opposed planar formations converging in complimentary relationship with the selected cam faces (38, 39 etc) on said support bar (28) to provide a wedging action between the latter (28) and the plunger (45).

4. The power saw according to any of the claims 1-3, characterized in that said aperture (22a, 22b) has a portion (22b) opening to the exterior of said nose section housing (12, 14) and wherein said plunger (45) includes an actuating formation (54) disposed exteriorly of the saw housing (12, 14) through said aperture portion (22b) to facilitate manual actuation of the plunger (45).

5. The power saw according to claim 2, characterized in that said cam faces (38, 39 etc) on the support bar (28) are defined by segments of an imaginary frusto-conical section and wherein said cam surfaces (48, 49) are defined by segments of a frusto-conical formation on said plunger (45).

Patentansprüche

1. Motorsäge (10) mit einem Gehäuse mit einem vorstehenden Abschnitt (12, 14), einem Sägeblatthalter (15), der gegenüber dem vorstehenden Abschnitt (12, 14) für Hin- und Herbewegung relativ zu ihm vorsteht, wobei der vorstehende Abschnitt (12, 14) mit einem Schlitz (20) versehen ist, der parallel und beabstandet zu dem Blatthalter (15) ist und zum Äußeren des vorstehenden Abschnitts (12, 14) offen ist, wobei der vorstehende Abschnitt auch mit einer Öffnung (22a, 22b) versehen ist, die in Verbindung mit dem Schlitz (20) steht, einem Auflageteil (28), das in dem Schlitz (20) für eine hin-

und hergehende Gleitbewegungen darin aufgenommen ist und ein äußeres Ende hat, einem Führungsschuh (25), der schwenkbar am äußeren Ende des Auflageteils (28) befestigt ist, dadurch gekennzeichnet, daß

a. das Auflageteil (28) die Form einer Stange mit mehreren Gruppen von Nockenflächen (38, 39; 40, 41; 42, 43) hat, die in Längsrichtung derselben beabstandet sind;
b. ein Kolben (45) in der Öffnung (22a, 22b) befestigt ist, für eine Bewegung entlang einer Bahn, die insgesamt rechtwinklig zur Bewegungsbahn der Trägerstange (28) verläuft;
c. Spannmittel (52), die den Kolben (45) in Eingriff mit der Trägerstange (28) drücken, vorhanden sind, und
d. der Kolben (45) Nockenflächen (48, 49) hat, die ein entsprechendes Angreifen an den Nokkenflächen (38, 39 etc.) eines ausgewählten Satzes von Nockenflächen zur Feineinstellung der Trägerstange (28) relativ zu dem Kolben (45) erlauben.

2. Motorsäge nach Anspruch 1, dadurch gekennzeichnet, daß die Nockenflächen (38, 39 etc.) zu einer, die Trägerstange (28) enthaltende Ebene geneigt sind, und wobei die Nockenflächen (48, 49) ebenso zu den Nockenflächen (38, 39) auf der Trägerstange (28) geneigt sind, um eine Keilwirkung zwischen letzterer (20) und dem Kolben (45) zu erzeugen.

3. Motorsäge nach Anspruch 1, dadurch gekennzeichnet, daß

a. jeder Satz von Nockenflächen (38, 39 etc.) ein Paar sich gegenüberliegender, ebener Gestaltungen umfaßt, die bezogen auf eine zur Bewegungsbahn der Trägerstange (28) rechtwinklige Ebene symmetrisch geneigt sind, um bezüglich der entsprechenden Nockenflächen (48, 49) auf dem Kolben (45) auseinander zu laufen;
b. wobei die Nockenflächen (48, 49) auf dem Kolben (45) sich gegenüberliegende, ebene Gestaltungen sind, die komplementär zu den ausgesuchten Nockenflächen (38, 39 etc.) auf der Trägerstange (28) aufeinander zu laufen, um zwischen letzteren (28) und dem Kolben (45) eine Keilwirkung zu erzeugen.

4. Motorsäge nach einem der Anspüche 1-3, dadurch gekennzeichnet, daß die Öffnung (22a, 22b) einen zum Äußeren des Gehäuses des vorderen Abschnitts (12, 14) offenen Abschnitt hat, und wobei der Kolben (45) eine Betätigungsgestaltung (54) hat, die außerhalb des Sägegehäuses (12, 14), durch den Öffnungsabschnitt (22b) verlaufdend, angeordnet ist, um eine manuelle Betätigung des Kolbens (45) zu erleichtern.

5. Motorsäge nach Anspruch 2, dadurch gekennzeichnet, daß die Nockenflächen (38, 39 etc.) auf der Trägerstange (28) durch Abschnitte eines gedachten Kegelabschnitts definiert sind und wobei die Nockenflächen (48, 49) durch Abschnitte einer Kegelstumpfgestaltung auf der Kolbenfläche (45) definiert sind.

Revendications

1. Scie (10) à moteur ayant un corps comprenant une section de nez (12, 14), un support (15) de lame de scie faisant saillie de ladite section de nez (12, 14) pour exécuter un mouvement alternatif par rapport à elle, ladite section de nez (12, 14) étant pourvue d'une fente (20) parallèle audit support (15) de lame et espacée de celui-ci et s'ouvrant vers l'extérieur de ladite section de nez (12, 14), ladite section de nez étant également pourvue d'une ouverture (22a, 22b) en communication avec ladite fente (20), un élément de support (28) reçu à l'intérieur de ladite fente (20) pour effectuer dans celle-ci un mouvement alternatif coulissant et ayant une extrémité extérieure, un patin de guidage (25) montée de façon pivotante sur l'extrémité extérieure dudit élément de support (28), caractérisée en ce que

a. ledit élément de support (28) présente la forme d'une barre ayant plusieurs jeux de face de came (38, 39 ; 40, 40 ; 42, 43) espacés sur sa longueur ;
b. un plongeur (45) est monté dans ladite ouverture (22a, 22b) pour effectuer un mouvement le long d'un trajet globalement perpendiculaire au trajet du mouvement de ladite barre de support (28) ;
c. des moyens de rappel (52) sont présents, sollicitant ledit plongeur (45) en engagement avec ladite barre de support (28) :
d. ledit plongeur (45) présente des surfaces de came (48, 49) conçues pour engager respectivement les faces de came (38, 39, etc.) de l'un, choisi, desdits jeux de face de came en réponse à un positionnement fin de la barre de support (28) par rapport au plongeur (45).

2. Scie à moteur selon la revendication 1, caractérisée en ce que lesdites faces de came (38, 39, etc.) sont inclinées par rapport à un plan contenant ladite barre de support (28) et dans laquelle lesdites surfaces de came (48, 49) sont également inclinées dans une relation de complémentarité avec lesdites faces de came (38, 39, etc.) sur la barre (28) de support pour produire une action de coincement

entre cette dernière (25) et ledit plongeur (45).

3. Scie à moteur selon la revendication 1, caractérisée en ce que

   a. chaque jeu de faces de came (38, 39, etc.) comprend une paire de conformations planes opposées inclinées symétriquement par rapport à un plan perpendiculaire au trajet du mouvement de ladite barre de support (28) afin de diverger par rapport à des surfaces de came respectives (48, 49) sur ledit plongeur (45) ;
   b. lesdites surfaces de came (48, 49) sur ledit plongeur (45) étant des conformations planes opposées convergeant dans une relation de complémentarité avec les faces de came choisies (38, 39, etc.) sur ladite barre de support (28) pour produire une action de coincement entre cette dernière (28) et le plongeur (45).

4. Scie à moteur selon l'une quelconque des revendications 1-3, caractérisée en ce que ladite ouverture (22a, 22b) comporte une partie (22b) s'ouvrant vers l'extérieur dudit corps à section de nez (12, 14), dans laquelle ledit plongeur (45) comprend une conformation d'actionnement (54) disposée extérieurement au corps (12, 14) de la scie à travers ladite partie d'ouverture (22b) pour faciliter l'actionnement manuel du plongeur (45).

5. Scie à moteur selon la revendication 2, caractérisée en ce que lesdites faces de came (38, 39, etc.) sur la barre (28) de support sont définies par des segments d'une section tronconique imaginaire et dans laquelle lesdites surfaces de came (48, 49) sont définies par des segments d'une conformation tronconique sur ledit plongeur (45).

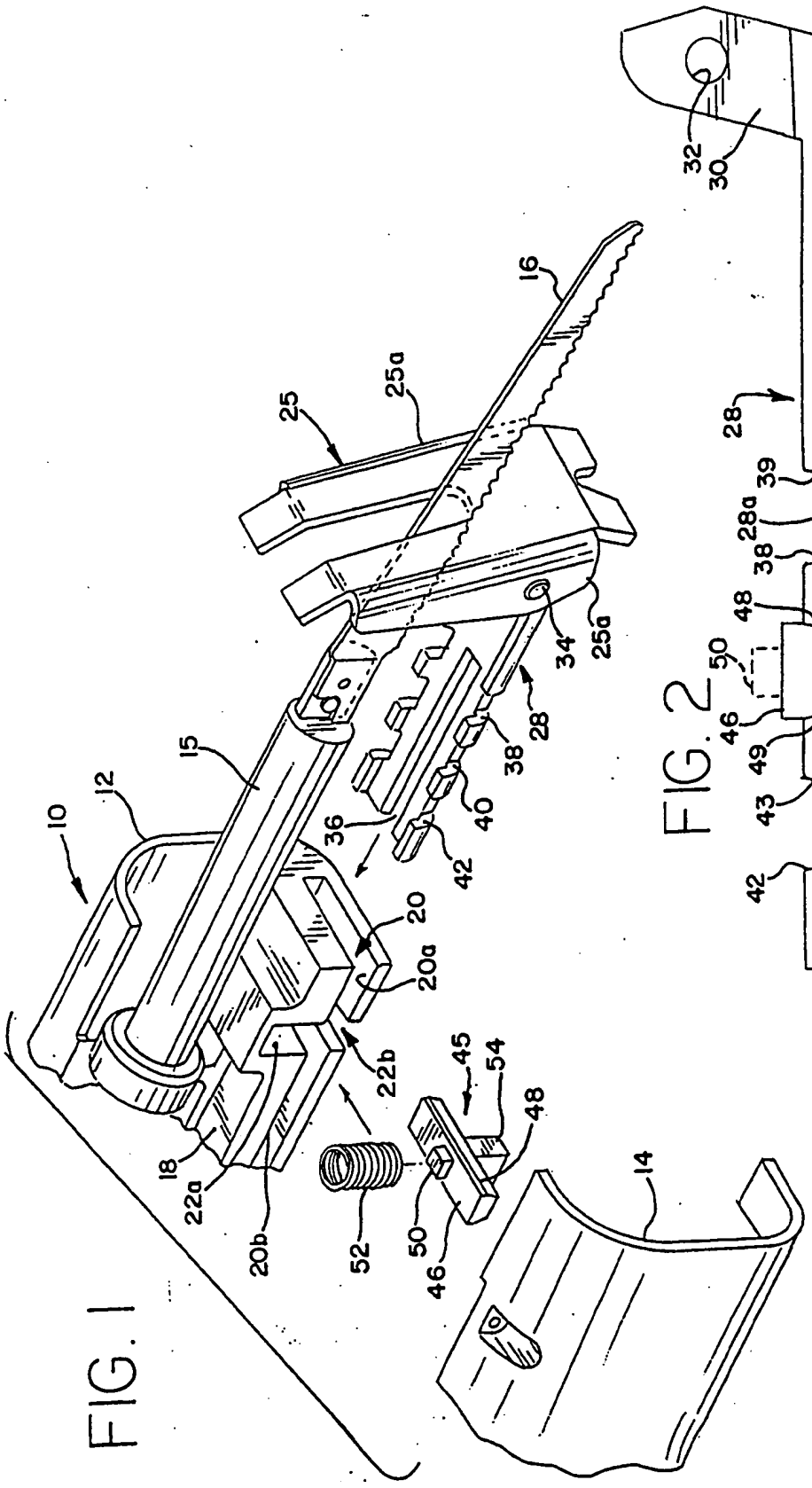
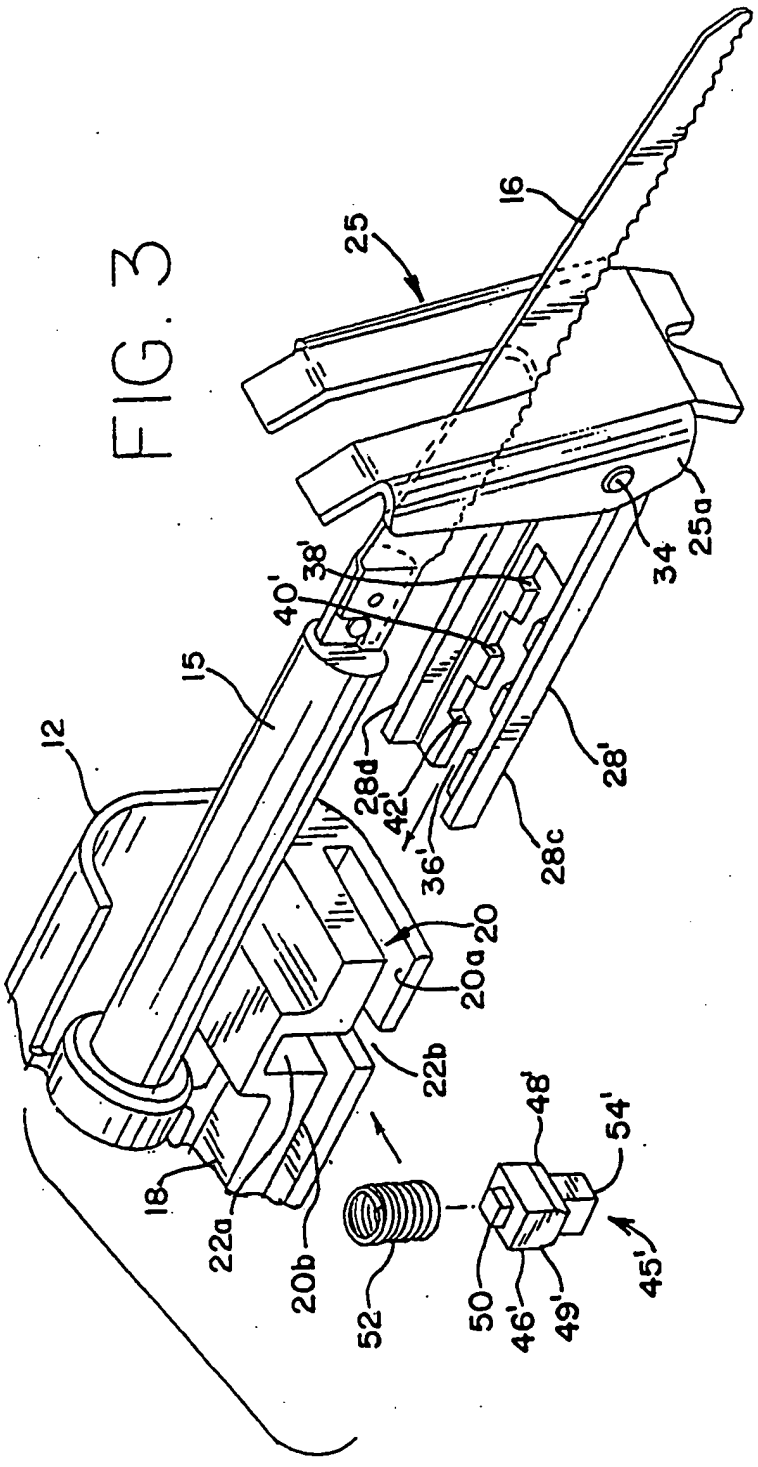


FIG. 1

FIG. 2

FIG. 3



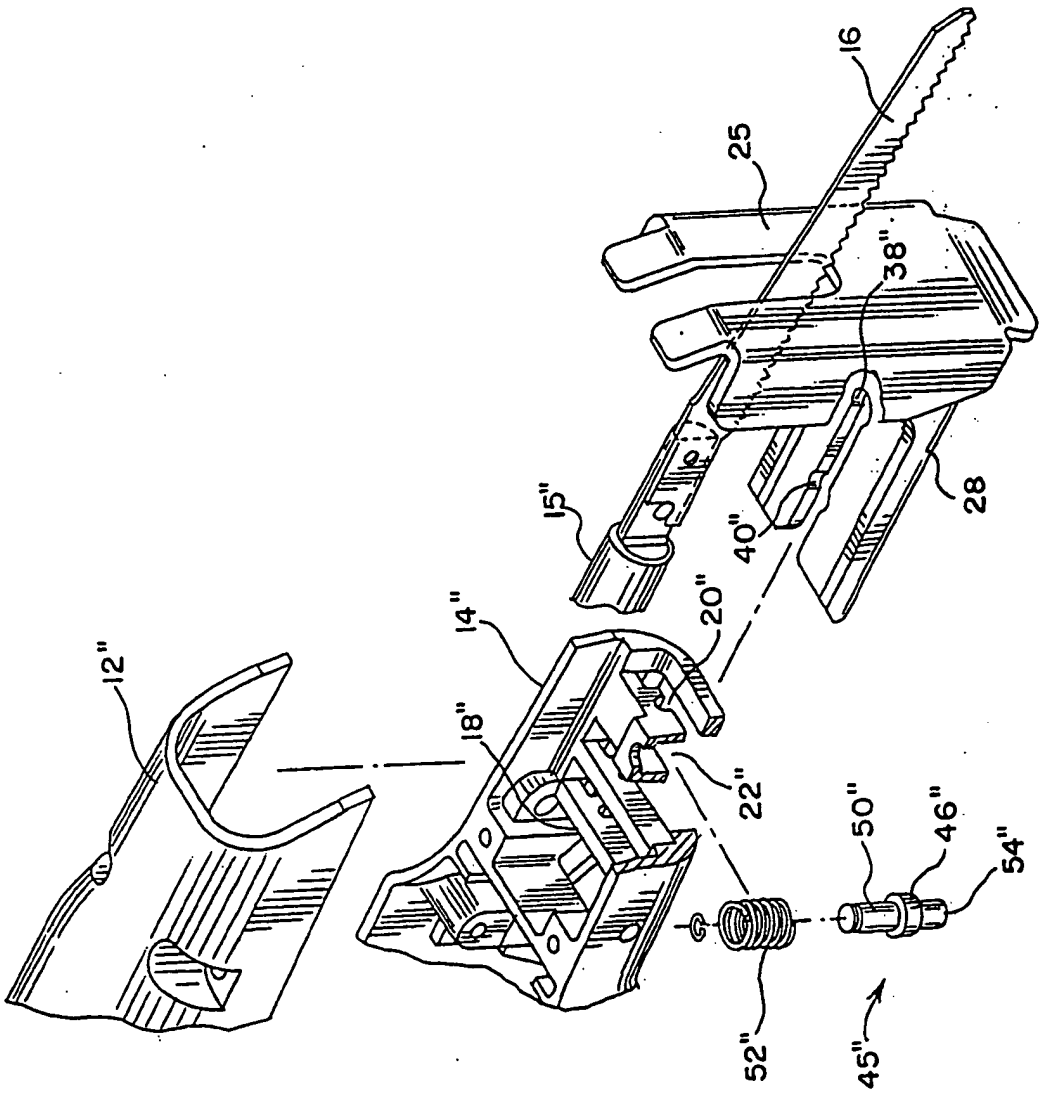


FIG.4